MINISTRY OF TRANSPORTATION

RoadTalk

Ontario's Transportation Technology Transfer Digest • November 2004 • Vol 10 Issue 4

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Highway Construction Bidding System

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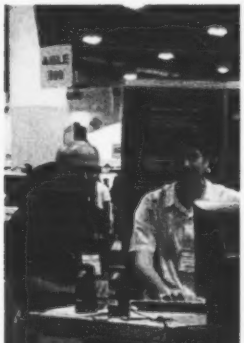

The Automated Vehicle Location system makes an impression at Showcase Ontario See page 5

Winter Technology Testing, 2004-2005

MTO's Winter Artillery

Pre-wet sand: one of the technologies MTO is testing to improve winter driving conditions.

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1. Direct Liquid Application (DLA)

DLA is the use of liquids on roads to prevent snow and ice from bonding to the pavement. This technology is applied before any precipitation starts, postponing or reducing the requirement for repeated salt applications during a long storm or under drifting conditions. DLA has been in trial implementation since 2002 (see "Liquid Relief," Road Talk, November 2002). The 2004-2005 season's evaluations will directly compare costs and service levels on roads with and without DLA. The results of these evaluations will assist MTO in further refining DLA implementation in Ontario.

2. Pre-wetting of Granular Salt

According to controlled tests and narrative field accounts, when granular salt has been pre-wetted, its effectiveness is improved. MTO is studying pre-wetting of granular salt to determine how it reduces overall salt use when the pre-wet rate is increased, or when different types of liquid or granular material are used. The study will help determine how MTO can maximize efficiency of material distribution at lower costs under different environmental and traffic conditions.

3. Pre-wet Sand

Sand has been a regular feature of winter maintenance operations in virtually all jurisdictions, as it creates traction when packed snow cannot be removed. >

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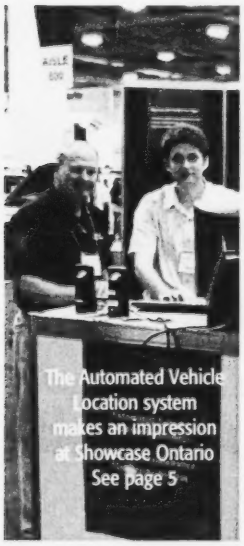

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Road Talk is prepared and published quarterly by the Resources Planning Office of the Program Management Branch, Ontario Ministry of Transportation. A circulation of 5,000 is distributed provincially, nationally and internationally. This publication reports on innovations and new technology relating to highway management; the design, construction, operation and maintenance of highway infrastructure.

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Technology Transfer is a communication process by which information, regarding an improvement in a product or method, is exchanged and implementation into practice is facilitated.

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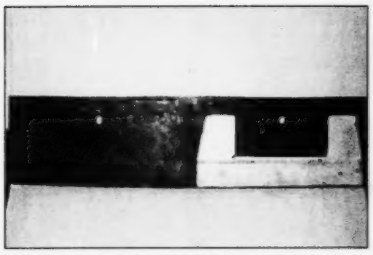


Above: One of the flexible blades that will be tested on snowplows this winter season.
Right: A truck applies liquid directly to a road as part of anti-icing operations.

> However, sand is constantly blown about by wind and traffic. The addition of liquids aids sand retention on the road. This project will determine whether pre-wetting winter sand improves retention on the pavement.

4. Spreader Evaluations

As salt spreaders apply salt to the pavement, the momentum of the truck movement causes the salt grains to bounce and scatter. As such, spreaders are required to travel slower than the flow of traffic to minimize this effect. MTO is evaluating several different devices on spreaders that can permit an increase in maintenance vehicle speed and spread salt or sand in the required width with reduced bounce. These include pre-wetting with liquid, accelerating the salt to the travel speed as it is ejected rearward, and ejecting it through various-shaped nozzles. The upcoming trials will see how these spreader devices perform in the field under normal winter operating conditions.

5. Flexible and Multiple Snowplow Blades

Flexible and multiple blades for snow plows, which make better contact with the pavement, have recently become available. They have the potential to increase the effectiveness of plowing operations and thereby improve the level of service, reduce the cost and amount of road salt needed for winter maintenance. The effectiveness and overall cost-benefit of these blades will be compared to standard blades under a variety of operating conditions. Results will determine what conditions are best suited to the use of these types of blades.

6. Friction Road Condition Report Testing

Friction road condition report testing is an attempt to gain an understanding of road surface friction during winter storms. A friction-measuring device will collect road surface friction data throughout the winter and during isolated storm events. The Ministry is interested in road surface friction information because it is both objective and quantifiable. It has the potential to make road condition reports more accurate by allowing reports to be provided on shorter road segments. The information will also be used to monitor and report bare pavement conditions. In the future, friction road conditions may be used to automatically classify road conditions, in a similar way to the currently used visual road reports.

7. Salt Spread Pattern Testing

Traditionally, granular salt is spread in a 30 cm narrow strip at the crown or superelevation of snow-covered pavement on Ontario highways. Recent improvements in both weather forecasting and pre-wet salt use may allow spreading to begin before snow has accumulated, without the salt being significantly scattered off the pavement. In these cases, it may be more effective to spread salt in a wide pattern, across the lanes. MTO is comparing narrow and wide spreading patterns to determine the effectiveness under different weather conditions, traffic patterns, and road configurations.

These evaluations demonstrate MTO's commitment to improving service and reducing costs in managing Ontario's highways. Look for testing results in future issues of Road Talk. •

For more information, please contact Jason Ranger, Maintenance Office, at (905) 704-2378 or Jason.Ranger@mto.gov.on.ca, or Max Perchanok, Maintenance Office, at (416) 235 4680 or Max.Perchanok@mto.gov.on.ca.

Subsurface Utility Engineering

A Process Named SUE

Southwestern Region is assessing a new utility location/identification process to ensure project employees have all the information they need on the job. This process, called Subsurface Utility Engineering (SUE), identifies utility infrastructure buried underground, and is intended to help keep projects on-time and on-budget, minimize work-related delays, and improve safety. The interchange upgrade at Homer Watson Blvd. and Highway 401 in Kitchener is the first MTO project to use this process. This pilot will help MTO determine the benefits of SUE for future detail design projects.

In a SUE investigation, utility line information can be identified to four increasing levels of quality. Staff must determine the potential impact of each utility and decide what quality of information is critical to safety and efficiency. Utilities that have only minor impact need only minimal investigation. Quality level D, the level of least detail, entails information about a utility gathered only from existing records and oral accounts. Quality level C supplements this with a visual survey of the aboveground indicators of utilities, such as manhole covers. The engineers then determine how this data fits in with the information from quality level D. Generally, a utility in a non-critical area of a project will suffice with only level D or C information. The higher the quality level, the more time and resources required.

When utility lines can have a crucial effect on a project's progress, quality level B or A is essential. Quality level B is achieved by using geophysical prospecting techniques, such as electromagnetic cable locate equipment and ground-penetrating radar, to determine the horizontal position of utilities. This creates a two-dimensional map for engineers. Quality level A involves installing test holes to gather data about the utility's size, orientation, material type, and depth, thus creating a precise, three-dimensional map of the utility.

Why is utility data so vital in a project? Inaccurate utility data, during the design stage, is typically one of the leading causes of cost increases and construction delays on projects. In addition, an accidentally cut utility line can cause major inconveniences for the people it services, and can also endanger personal safety and lives. It is imperative that both the designer and labourers can get the best information they can when working on a project.

Southwestern Region selected the Homer Watson Blvd./Highway 401 interchange upgrade for this SUE trial because of the nature of the project. The scope of this project is extensive, including bridge replacement, building new ramps, reconstruction and realigning some of the existing ramps, and expanding the commuter parking lot. This interchange has a variety of utilities, a high volume of traffic, and a limited right-of-way for construction, making it a good candidate for a pilot use of the SUE process.

SUE is a part of MTO's effort to prepare contract packages with more accurate information. It also shows MTO's continuing efforts to mitigate construction conflicts, delays, and claims. Construction on this project is expected to begin in spring 2005. ●

For information, contact Tanya Cross, Planning and Design, at (519) 873-4555 or at Tanya.Cross@mto.gov.on.ca or Randy McIntyre, Planning and Design, at (519) 873-4547 or at Randy.McIntyre@mto.gov.on.ca

A

A: Vacuum excavation equiment at the Hwy 401/Homer Watson Blvd. project.
B: A test hole installed on a utility structure. Photos courtesy of Lawrence Arcand, TSH/TBE Subsurface Utility Engineers.

CIREAM Silver at Public Sector Quality Fair

An MTO initiative entitled "Cold In-place Recycling with Expanded Asphalt" (CIREAM) was awarded a Silver Award at the Public Sector Quality Fair in Toronto. Applications were assessed using a quality framework based on the National Quality Institute's Canadian Quality Criteria for Public Sector Excellence. The submission outlined the ministry's commitment to technical innovation, partnership with industry, and the efforts of the Materials Engineering and Research Office, Eastern Region Contracts, and Geotechnical. MTO constructed the CIREAM trial section on Highway 7, east of Perth in July 2003. Left to right: Susanne Chan, Becca Lane, Guy Cautillo, Melissa Buelow.

Asset Management Update

Priority Economic Analysis Tools

Deciding between competing highway investments can be a challenging exercise. The Ministry of Transportation (MTO) must decide how to make the right investment in the right place at the right time, working within a constrained budget. The tools and methodologies of the Asset Management Business Framework are designed to assist with these decisions.

MTO decision-makers must assess whether a transportation investment is justified in terms of expected benefits. Across the highway network and various asset types, MTO must determine which investments maximize the benefits to the organization and public. Which investments minimize costs both now and in the future? Do the benefits outweigh the costs? Performing an economic analysis can help answer these questions.

Economic Analysis is a method for evaluating and comparing project alternatives. It provides one of the data points required to determine the "best" alternative. Economic Analysis results can help:

- Capture agency and road user costs,
- Structure project-level tradeoffs, and
- Support repeatable and transparent project justification and prioritization.

MTO hired Cambridge Systematics to develop an Economic Analysis tool that would be quick and easy to use, and be built using the best practices of transportation Economic Analysis. There has been significant work completed on transportation Economic Analysis around the world, and CS has brought together the "best of the best" for a custom-designed MTO tool.

Following an intensive 6-month assignment, Cambridge Systematics and the MTO Asset Management Group have successfully developed a Priority Economic Analysis Tool, or PEAT, to calculate economic benefits and costs for highway project investments. The tool is a Microsoft Excel workbook that includes separate worksheets to analyze highway, bridge, intersection and expansion types of investments. A three-level cost estimating tool has also been built into PEAT that allows cost estimates to be refined as more project detail becomes available.

A proposed highway improvement project can be compared to a base case level of improvement or it can be compared relative to doing the proposed work now or later. The base case consists of the required day-to-day work on the pavements, such as routing and sealing cracks, and filling potholes, but excludes major rehabilitation treatment such as resurfacing. The Economic Analysis will determine the benefits and costs based on a comparison to the base case or based on the difference in timing. The PEAT tool will do this analysis using input data for both the current and future highway conditions. The difference in road user costs between doing only the base case improvements and the proposed rehabilitation are the calculated benefits of the proposed work.

For individual projects, the PEAT tool will calculate costs including

- Costs to the agency incurred for con struction, design, property, & administration
- Costs to the road user resulting from travel time delays, accidents, and vehicle operation

The PEAT tool also calculates benefits including

- Benefits for the agency, such as cost savings on future maintenance as pavement deteriorates
- Net present value, defined as the present discounted value of expected future expenditures on or revenues from an investment, less the cost of the investment

By taking a ratio of benefits over costs, or b/c ratio, MTO can determine which projects are economically viable (b/c>1).

The concept of "priority" is significant when making trade-off decisions. The PEAT results will assist with an initial cut at prioritizing highway investments. However, focusing on economic benefits alone is not desirable, as it tends to favour investments on high volume roads. It is legitimate to consider a wide range of transportation impacts when making resource allocation decisions. Given that some of these impacts don't lend themselves easily to economic analysis, MTO must also consider aspects such as:

- Non-economic criteria, including community and environmental impacts
- Economic development
- Transit alternatives
- Available budget and resources
- Performance measure targets

Examination of these criteria along with the PEAT analysis will be very useful towards the challenges facing MTO in making provincial highway investment decisions in the future. •

For information, please contact Erika Rupnik, Asset Management Group, at (905) 704-2413, or at Erika.Rupnik@mto.gov.on.ca

New Transportation Research Portal

Transport Canada has launched a website called the Canadian Transportation Research Gateway, creating a common starting point for researchers, students, government, and industry. The Gateway is a product of collaboration between five Canadian transportation libraries. Visit the site at:

http://www.tc.gc.ca/ctrg-prtc/

AVL Wins at Showcase Ontario

Improving Highway Safety

As winter approaches, MTO stands prepared for the effects of inclement weather on our roads. The ministry is armed with innovative solutions such as the Automated Vehicle Location (AVL) system, a technology that was recently honoured at Showcase Ontario in Toronto.

AVL is a vehicle tracking system that uses Global Positioning System (GPS) technology to keep up-to-date information on location and activity of maintenance vehicles across the province. The system was first spotlighted in Road Talk's November 2002 issue.

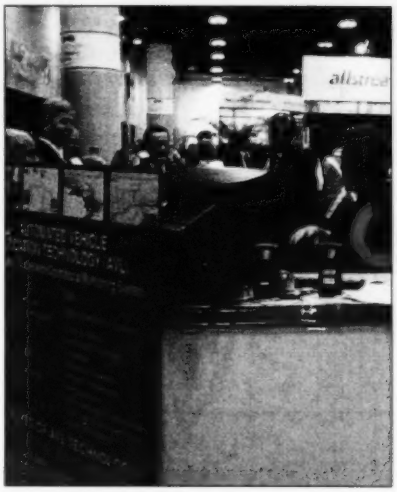
At Showcase Ontario, AVL won an Award of Merit in the category "Serving Ontario's Citizens Better." This category recognized Ontario public sector projects that significantly improve the service or quality of service for Ontario's citizens. Winter conditions can last up to eight months in northern regions. Therefore, it is essential that the ministry have the most comprehensive information system possible. With the wealth of data provided by AVL on the maintenance vehicles, combined with its links to COMPASS (the freeway traffic management system developed by MTO) and ARWIS (Advanced Road Weather Information System), maintenance staff can respond to highway conditions quickly.

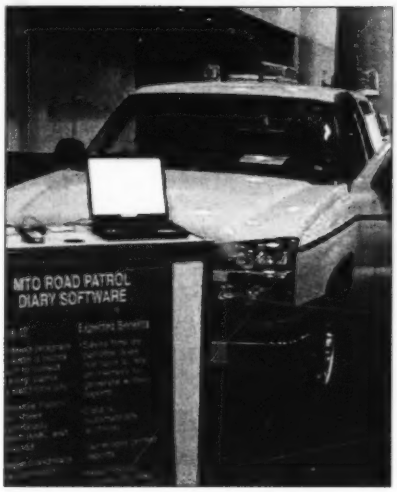
Furthermore, AVL helps drivers by increasing highway safety. During a storm, maintenance staff can use AVL to monitor all equipment deployed and, if necessary, redirect vehicles to where they are needed most. AVL's archived data is also useful for analysis of past storm events, tracking material usage, and planning.

AVL technology continues to develop in the ministry. Data refinement and automated report generation are items to be enhanced this year. The system is also being evaluated on line-painting trucks as a measurement tool for paint usage, line thickness, and distance painted. Further linkages between the Road Patrol Diary Software and AVL are also planned. As AVL technology gets more and more advanced, it comes closer to giving its users a complete picture of maintenance activity on Ontario's highways.

The Showcase Award of Merit recognized AVL's success in making MTO's maintenance operations the most responsive possible. Using AVL shows how MTO efficiently manages Ontario's winter highway operations, thanks to the continuing efforts of field staff and support from the Maintenance Office in St. Catharines. ●

For more information, contact John Roberto, Maintenance Office, at (905) 704-2973 or at John.Roberto@mto.gov.on.ca.





Top: People congregate at the AVL booth at Showcase Ontario at the Metro Toronto Convention Centre, September 13-15.
Above: An AVL-equipped pick-up truck with Road Patrol Diary Software.
Left: The AVL team, from left to right, back row: Shaf Khan, Shael Gwartz. Front row: Brett Clemens, Darren Waters, John Roberto, Ken Polson, Steve Welch, Barry Irvine, and Torb Frederikson.

The Transportation Technician Initiative

Star "Techs": The Next Generation

As Road Talk reported in February 2002, MTO and the Operations Division are developing new ways to recruit employees into its workforce. One of these youth recruitment efforts is the Transportation Technician (TT) initiative. TTs are entry-level permanent positions, designed to maintain MTO's technically knowledgeable workforce.

TTs start at the ministry with three years of rotational assignments. Single rotations can be of varying lengths, from less than six months to a year. During their rotational component, TTs have assignments in engineering, contracts (construction and maintenance), and operational services. TTs develop greater breadth than their private-sector colleagues through these practical and multifunctional learning experiences. TTs also benefit by making professional contacts and having access to opportunities to take on progressively challenging opportunities.

The concept for the TT initiative began in 2000, with the first wave of competitions occurring in May 2001. This initial group of TTs finished their rotations earlier this year in May. The creation of the TT initiative was in response to projected retirements in some of MTO's key technical positions by 2009. "A great deal of our senior technical staff will be retiring," said Sam Cheng, the chair of the original TT Steering Committee.

The focus on learning and the variety of areas of experience were the two major factors that attracted Derek Illman, a TT currently working in the Contracts Section in Southwestern Region, to the ministry. Illman came to the TT initiative after working in construction inspection in the private sector. "My experience in the private sector prior to joining the MTO did not include training/development as a high priority," said Illman. In contrast, MTO staff "take time out of their schedules to teach or answer any questions that I have had." Illman has already completed rotations in the Geotechnical Section and the Planning and Design Section, working with applications such as the Highway Design System.

Erin McGowan, a TT now in the Planning and Design Section of Eastern Region, similarly noted that the TT position is a "constant opportunity to learn on the job and in the classroom." Being familiar with provincial government work from previous summer job experience, she saw the TT initiative as a way to "apply [her] educational background." McGowan's rotations have taken her to the Contracts Section, the Materials Engineering and Research Office, the Geotechnical Section, and Technical Services, Port Hope Area.

Breadth of experience was important for Robbie Nichol, a TT working in Bridge Maintenance. "In applying to MTO, I wanted to...have the opportunity to work in a much broader field of operation within the transportation industry," he said. Nichol previously worked in COMPASS, MTO's freeway traffic management system, when the Fleetnet radio system was implemented, and in the Materials Engineering and Research Office in the Concrete Section. The independence and significance of his work contributes to Nichol's job satisfaction: "It gives me a sense of pride that I'm doing something significant that affects people." Nichol also said the nature of the TT initiative meant it built upon his previous education. "It is a permanent career door with the chance to make the most of my interests, education, and find a place within the industry that suits me personally," he said.

Overall, the initiative has been invaluable in succession planning. "TTs are an integral part of the technical stream structure," said Cheng. The TT initiative is key in making sure Operations Division continues to have a capable technical staff working on every facet of Ontario's highway management system. ●

Shawn McGuire and Ken Brisbois in the foreground observe project that widens over 13 km of Hwy. 401 between Hwy. 77 and Essex Road #42

For more information, please contact Peter Makula, Manager of Engineering, Northwestern Region, at (807) 473-2001, or at Peter.Makula@mto.gov.on.ca.

Conference Reports for MTO Subscribers

Have you viewed our updated conference reports on Operations Online lately? Engineering Standards Branch has recently contributed the following reports to our line-up:

- Transportation Research Board Performance Measures to Improve Transportation Systems, 2nd National Conference -Erika Rupnik
- Annual Conference and Exhibition of the Transportation Association of Canada -James Carr
- North Atlantic Transportation Planning Officials Conference -Steve Needham
- Precast/Prestressed Concrete Institute Convention 2004 -Iqbal Husain

Check them out at::
http://intra.mto.gov.on.ca/
>Then click on "Divisions & Locations"
>Then click on "Operations Online"

Retired MTO Employee Among Canada's Best

Roger Dorton Enters Order of Canada

Dr. Roger Dorton, a retired employee of MTO, was recently honoured with membership in the Order of Canada in recognition of his unique contributions in the field of bridge engineering. One of Canada's most prominent civil engineers, Dr. Dorton is renowned for his expertise in bridge design. He retired from the ministry in 1993 after a distinguished 21-year service first as an outstanding research engineer and later as manager of the ministry's Structural Office (today's Bridge Office).

Dr. Dorton graduated in civil engineering from the University of Nottingham in 1951. After research work in suspension bridges, he obtained his PhD from the same university in 1954. He started his working life in Canada in 1956 when he joined a Montreal firm, at a time when long-span bridge construction was starting in Canada with the development of the St. Lawrence Seaway. Dr. Dorton was responsible for innovative designs of several major seaway bridges with spans exceeding 210 metres, including the Champlain Bridge in Montreal. In 1965, he became a partner at a firm that won a competition for 19 canal bridges at Expo '67 and was responsible for designing a number of landmark bridges, including the A. Murray Mackay Suspension Bridge in Halifax. This bridge was the first in North America to use an orthotropic steel deck design.

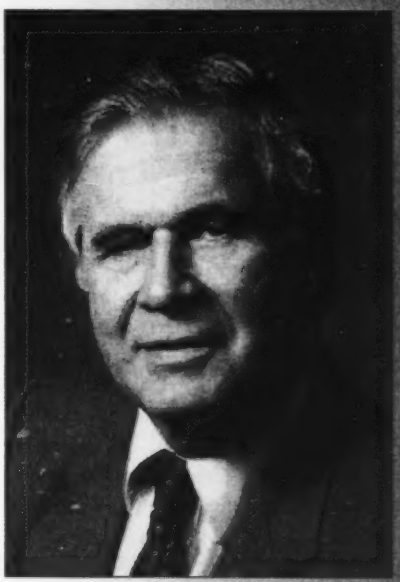
In 1972, Dr. Dorton joined the Ministry of Transportation of Ontario as Principal Research Officer before eventually becoming its "Chief Bridge Engineer" as manager of the Structural Office. Dr. Dorton's legacy with MTO centres on his pioneering work in bringing limit state philosophy to bridge design. He was instrumental in the development of North America's first limit state bridge design code, the Ontario Highway Bridge Design Code (OHBDC). The OHBDC is widely regarded as a world-class document and has been used as a model for other national bridge codes around the world, including the American Association of State Highway and Transportation Officials' (AASHTO) Load and Resistance Factor Design Bridge Design Specifications, as well as new bridge codes developed in Australia and New Zealand. The recently published Canadian Highway Bridge Design Code is also modelled on the Ontario Highway Bridge Design Code.

Beyond the bridge code, Dr. Dorton was responsible for new bridge and rehabilitation designs, with a construction value of $40 million per year. Some of the most significant projects designed in the Structural Office during this period include: the Twelve Mile Creek/Hwy 406 bridges in St. Catharines, with two continuous precast segmental concrete bridges; Madawaska River Bridge in Arnprior, a three-span continuous steel bridge with a main span of 122 metres; the Burlington Bay Skyway twinning project; and the Hwy 400/407 Interchange, with four levels of prestressed concrete bridges.

After retiring from MTO, Dr. Dorton joined a Vancouver firm where he worked on a number of important bridges, including the second Blue Water Bridge in Sarnia. He has also lectured internationally on bridge engineering and has shared his knowledge with many developing countries.

The Order of Canada is the latest of many prestigious honours Dr. Dorton has received for his work. In 2002, he was awarded the Canadian Society for Civil Engineering (CSCE) Award for Outstanding Contributions to Bridge Engineering, and has received numerous honours from AASHTO, the Association of Consulting Engineers of Canada, and the Association of Professional Engineers, Ontario, among others. He has also received honorary doctorate degrees from Queen's University and the University of Waterloo. Dr. Dorton is a fellow of the CSCE, the American Concrete Institute, the Engineering Institute of Canada, and the Canadian Academy of Engineering.

Dr. Dorton is a significant part of MTO's past, and his contributions continue to make a lasting impression in North America's highway infrastructure. ●



Dr. Roger Dorton, MTO's bridge engineer until 1993, was a pivotal figure in the development of the groundbreaking Ontario Highway Bridge Design Code. He also played a role in the design of many new bridges, and continued after retirement to improve Canada's highway infrastructure through consultant work.

For more information, please contact Clifford Lam, Bridge Office, at (905) 704-2356 or at Clifford.Lam@mto.gov.on.ca.

Highway Construction Bidding System

On A Winning Streak

The Ministry of Transportation's Highway Construction Bidding System (HCBS) launched in February this year and since then has been embraced by industry. HCBS was honoured with a variety of awards at three fairs in September and October.

HCBS, previously known as the Electronic Bidding System (EBS), is a web-based online initiative for the tendering process of MTO contracts. Previously, tendering was done through courier mail and/or faxing, involving paper documentation. As profiled in the November 2002 issue of Road Talk, HCBS allows for Internet transmission of project plans and specifications, tender announcements, and bid submissions and notification. The advantages of an online system are convenient, 24-hour accessibility; cost savings from vastly reduced shipping and printing for both MTO and contractors; and increased, simplified communication with industry.

Industry support for HCBS has been very strong. Contractors participated in a two-week trial in November 2003, and 29% rated the system excellent. 60% gave a rating of above average, only 11% rated it average, and no one rated the system below average.

Doug Pennell of the Construction Office believes the warm reception to HCBS is a product of a stringent quality assurance process with MTO's Information and Information Technology Cluster. He also attributed HCBS being on-time and on-budget due to the co-operation between business and information technology.

At Showcase Ontario, HCBS received an Award of Merit in the category "Business Solutions Through Information Technology." This category rewards projects that have a high level of user acceptance, deliver significant benefits to customers, demonstrate the ability of the IT team to approach the problem from the customer's perspective, and are innovatively designed and user-friendly. Nominated projects may also support the potential of knowledge management in new, innovative ways.

HCBS was also honoured at the Annual Distinction Awards Program as part of GTEC WEEK (October 18-20), the largest information technology showcase for the public sector in North America. HCBS won a Silver Award for Innovative E-Government in the Provinces. E-government refers to the transformation of government through electronic service delivery, by increasing connectivity and public participation, as well as supporting e-business in the global economy.

HCBS team members Dave Fulton (left) and Mike Pisano at the Provincial Sector Quality Fair proudly hold their Silver Award.

Recently, HCBS won an award at the Public Service Quality Fair. The fair awards projects to promote quality management principles and practices among the public sector. HCBS won a Silver Award, recognizing continual improvement while using several elements of a quality management system.

HCBS is an example of how communication between government and industry in the developmental process can lead to an acclaimed web-based application. This highlights how MTO is implementing smarter strategies to create the best, most efficient systems possible. ●

For more information, please contact Doug Pennell, Construction Office, at (905) 704-2144, or Doug.Pennell@mto.gov.on.ca.

Reader Response

Please help Road Talk become more effective

Send us any ideas, comments, or suggestions concerning local innovations, workshops, or seminars that you would like to see included in future issues.

Road Talk is also available in French.

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